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Environmental Assessment Review
Examen des évaluations environnementales

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Review Office
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1982.05.17

Mr. R. Owens
Manager, Environmental Services
Foothills Pipe Lines (South Yukon) Limited
1600 - 205 - 5th Avenue S.W.
Calgary, Alberta
T2P 2V7

4300-38P

Dear Mr. Owens:

Re: Alaska ~~Alberta~~ Highway Gas Pipeline: Technical Hearings, Whitehorse, June 7, 1982.

The Environmental Assessment Panel has reviewed the Foothills documentation submitted in March of this year. On the basis of this initial review, the Panel will include the following questions in the course of the technical hearings. These points are not taken as deficiencies at present. They are matters requiring clarification and/or amplification. There will be additional questions raised at the hearings.

1. Geotechnical

Submission 4-2

1. The Panel has been informed that acceptable frost heave is in the range 150 to 800 mm. Information is required concerning experiments, and calculations and input parameters leading to these values, sufficient to demonstrate the proper assessment of the complex thermodynamic and deformation properties of the freezing soil.

2. It must also be demonstrated that the designs to limit (or, in the event, to prevent) frost heave will ensure that displacements are restricted to those acceptable. Submission 4.2 is deficient in two respects especially:

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a) the instability of already-frozen ground should be examined, with particular regard to published reports of slow accumulation of ice within it in association with migration of moisture along temperature gradients. Such secondary frost heave may necessitate important changes in design concepts.

b) more information on soil thermal and thermodynamic properties and on the calculations for worst-case conditions is required, in order to give confidence that frost heave can be limited to the extent demanded using the conceptual designs proposed.

## 2. Hydrology

### Submission 3-4, Swift River/Rancheria River routing alternatives

The distances between access roads for the preferred alternative No. 2 (2 over 30 km) are much longer than those for alternative No. 1 (maximum about 14 km). Is this realistic, or will more access roads be required once the alternative is approved? That would likely require additional river crossings, with additional environmental impact.

### Submission 3-5, Kluane Lake routing alternatives

The submission states that the insulation layer of organic mat and vegetation must be protected from damage. The layer will, however, be damaged (i.e. compressed) by the suggested end-dumped fill, which will reduce both its insulating value and its transmissivity.

### Submission 4-1, Alternative Design Modes

Appendix I, p. 39 (5.6.1): If permafrost aggrades upward below the workpad and/or berm, this will impede water movement in the active layer. This may force groundwater to the surface which in turn would lead to icings and possibly frost "blistering"; it may require additional drainage measures. Also see comments re Submission 4-6.

### Submission 4-2, Frost Heave and Thaw Settlement

This submission contains a serious inconsistency. Part 2, page 1: "The pipeline will be operated continuously at temperatures below 0°C for the first 60 km or so of the pipeline route between the Alaska/Yukon border and Station 311".

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Part 3, page 1: "The pipeline will be operated continuously at temperatures below 0°C for the first 214 km of the pipeline route between the Alaska/Yukon border and Station 313". Which of these two statements is correct? What problems will be encountered and what special designs needed in the stretch between km 60 and km 214, not dealt with in this submission?

Submission 4-2, Part 2

On page 4 it is assumed that a sufficient supply of groundwater is available to supply frost susceptible soils. However, the descriptions of the Calgary and Fairbanks test facilities (p. 17-28) do not indicate the position of a water table at these locations. Does this imply that the water table at these sites was below the level affected by the installed test sections? If so, how representative can these sites be of conditions along the problem sections along the route?

Submission 4-2, Part 2

Section 5.0, Heave Prediction, is correct in stating "there is no complete and proven theory to predict frost heaving at the present time". It then goes on to use a kind of depth rate of heave ($\Delta h \; \Delta x$), on p. 31; stating that the instantaneous "ISR" will decrease with faster freezing (p. 32); stating that the ISR is a function of two variables, rate of freezing dX/dt, and effective overburden pressure $\sigma'$, but omitting any mention of hydraulic conductivity and potential in the non-frozen material (p. 32); that more frost susceptible soils will not be tested to any extent, because mitigation will be required to reduce or prevent frost advance, without stating how it will be determined whether frost advance is reduced sufficiently to prevent heave (p. 33); stating that the time rate of heave (dh/dt) is a function of frost penetration rate and effective stress o', again omitting mention of hydraulic conductivity and potential in the non-frozen material (p. 34); and then quoting a reference that is not listed, to the effect that "total heave rate" steadily decreases as the frost advance rate decreases. (p. 35).

The question is: Does heave have to represent ice segregation?

Submission 4-2, Part 3

Parameter symbols appear to be missing from the first two lines on p. 19, and from the first line of the last paragraph on p. 19.

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## Submission 4-3, Slope Instability

Parameter symbols appear to be missing from:

p. 26, second line from bottom;

p. 96, bottom line; p 97, top line.

Table II: it is doubtful that the "verified" factors of safety for the case of Figure 7 (1.09 to 1.17) have taken into account the very significant flow velocities that have to occur to produce and maintain the ground water table shown in the cross section. Very extensive groundwater drains would have to be installed to stabilize the situation shown in Figure 7, notwithstanding the values for F.S. produced by the calculation scheme.

## Submission 4-6, Project Induced Icings

Re page 4: construction of a berm will cause compaction of some waterbearing materials, with loss of transmissivity; this in turn may force groundwater out to the surface (leading to icings), or it may produce pressure build-up below seasonal frost, leading possibly to frost "blistering" (see NHRI Paper No. 8).

Re page 5: section of text appears to be missing between the bottom of page 4 and the top of page 5.

## Submission 6-2, Waste Disposal

Re pages 3 to 10:

(a) "lagoons......with impermeable soils......with the lagoon bottom greater than one metre above maximum ground water elevation". Are the soils impermeable enough to retain stored materials for a full year?

(b) The nature of the disposed materials (ethylene glycol, methanol, sodium and calcium hypochlorite, ferric sulfate, caustic soda, acids, film-processing liquids, bacteriocides, etc.) make it undesirable to flush lagoon effluents into receiving waters, even after one year, without some very careful testing. Specifications and guidelines under 5-1(a) on page 5-1 may be inadequate. Table 3 indicates bacteriocides go into a landfill, p. 4-9 and 10 indicate they go into the lagoon. Which is correct?

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3. Design Mode

(Questions on this subject will be raised at the technical hearings.)

4. Revegetation Submission 4-7

1. What is the basis and rationale for the establishment of the criteria upon which the revegetation program will be assessed (Table 4.19).
2. With reference to a Yukon nursery for growing stock? Indicate location(s), timing and how long it will take to establish?
3. How can acceptable revegetation results be obtained in arid sections of route (RMA #2, #3).
4. There is no information on volumes of seeds required, who will produce the supply and how long it will take.

5. Fisheries, Wildlife and Scheduling

(Fisheries questions will be addressed at the technical hearings.)

Wildlife

1. Submission 3-3, pp. 50-51 re Ditch Plugs to facilitate ungulate crossings. What are the criteria for ditch plugs - frequency and dimensions?
2. Submission 3-4, p. 41. Ungulate crossing sites. Is the statement that crossing sites will be provided at 250 m intervals applicable to all caribou and moose winter ranges? Will it be a discretionary decision and if so what will be the basis for implementing or not implementing the measure?
3. Submission 4-1, p. 39. Can the proponent provide reference to successful use by ungulates of ramps similar to the design proposed, or specific references used in developing the design criteria? Will a monitoring program be developed to assess the effectiveness of ramps for ungulate crossings?

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Aesthetics Submission 7-1

Issues will be discussed at the technical hearings.

Noise Submission 7-3

Noise issues to be discussed at the technical hearings.

Campground and Recreation Areas Submission 7-5

Issues will be discussed at the technical hearings.

Please contact the undersigned if there are questions on this matter.

Sincerely yours,

Patricia Duffy

P.J.B. Duffy
Executive Secretary
Alaska Highway Gas Pipeline Project
Environmental Assessment Panel

Date Due

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